

NASA TECH BRIEF

Marshall Space Flight Center



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

Model Optimization Using Statistical Estimation

The problem:

An analytical structural model is needed that will match the data obtained from dynamic testing. This would make possible more accurate dynamic data for flight hardware with meaningful tolerances. Consequently, a more refined control system could be designed, and realistic stability margins could be defined.

The solution:

A computer program has been developed which revises an initial or prior estimate of stiffness and mass parameters to parameters yielding frequency and mode characteristics in agreement with test data. Variances are also calculated and, consequently, define the uncertainties of the final estimates.

How it's done:

A Bayesian decision theory approach is used wherein the uncertainties are estimated for the mass and stiffness parameters based on experience. These estimates are input into the program along with the mass and stiffness data, the test data, and estimates of the accuracy of the test data. The program then operates

on the data and produces new physically-consistent mass and stiffness matrices which will reproduce the test data (with accuracy constraints).

Notes:

1. This program was written in FORTRAN V for the UNIVAC 1100-series computers.
2. Inquiries concerning this program should be directed to:

COSMIC
112 Barrow Hall
University of Georgia
Athens, Georgia 30601
Reference: MFS-22873

Source: J. D. Collins, G. C. Hart,
T. K. Hasselman, B. Kennedy, and
H. Pack, Jr., of
J. H. Wiggins Co.
under contract to
Marshall Space Flight Center
(MFS-22873)